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Towards nondestructive state detection of SiO^+ HUANQIAN LOH, SHIQIAN DING, ROLAND HABLUTZEL, DZMITRY MATSUKEVICH, Centre for Quantum Technologies, National University of Singapore — Molecular ions, with their long coherence times and rich internal structure, are suitable candidates for precision measurement studies such as the variation of fundamental constants. Detecting the state of molecular ions, however, tends to invoke destructive methods such as resonance-enhance multi-photon dissociation (REMPD). In contrast, photon recoil spectroscopy and quantum logic spectroscopy are two techniques that offer nondestructive state detection. Both techniques involve mapping the internal state of the spectroscopy ion onto the motional state of an auxiliary ion that can then be detected using Raman lasers. We report on our application of both techniques on two co-trapped Yb^+ ions of different isotopes. We also discuss our general progress towards implementing them on the SiO^+ molecular ion.

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